Second language writing anxiety and ChatGPT adoption as an automated writing evaluation tool

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Abstract

Purpose – This study examines the relationship between the writing anxiety experienced by English second language learners and their intention to employ ChatGPT for their academic writing as an automated writing evaluation tool. This research integrates writing anxiety as an additional variable to understand how much writing anxiety affects the perceived usefulness of ChatGPT as an automated writing evaluation tool, perceived ease of use of ChatGPT, and attitude towards using ChatGPT as an automated writing evaluation tool for their academic writing with the technology acceptance model (TAM) as a theoretical framework.

Design/methodology/approach – This is a cross-sectional study, with SEM PLS to analysis data collected from 639 undergraduate students.

Findings – This study found that writing anxiety significantly affects perceived ease of use of ChatGPT as an automated writing evaluation tool, and attitude towards using ChatGPT. Altogether they both influence students' intention to use the ChatGPT as an automated writing evaluation tool.

Originality/value – This study contributes to the understanding of students intention to use ChatGPT as an automated writing evaluation tool when they suffer from writing anxiety.

Keywords ChatGPT, Writing anxiety, Second language learners, Technology acceptance model, Automated writing evaluation

Paper type Research paper

1. Introduction

Research consistently demonstrates that anxiety and discomfort significantly impair students' writing performance. High levels of anxiety are linked to decreased efficiency and overall writing task performance (Limpo, 2018). Writing anxiety issues are widespread and manifest as stress, exhaustion, and disinterest, hindering students' writing processes (Nurkamto *et al.*, 2024; van der Rijst *et al.*, 2022; Gardner *et al.*, 2018; Waer, 2021; Al Maawali, 2022; Strickland *et al.*, 2022). Among Chinese students, cognitive anxiety is prevalent during English writing tasks, negatively affecting their performance (Chiang, 2012; Zhang and Zhang, 2022), underscoring a critical issue in educational and psychological contexts that necessitates targeted support strategies.

Feedback mechanisms play a crucial role in enhancing students' writing skills and alleviating writing anxiety. Regular feedback from teachers and peers has been shown to improve writing abilities and boost confidence (Park, 2020; van der Rijst *et al.*, 2022). Technological advancements have introduced computer-mediated feedback, such as automated writing evaluation tools, which provide less anxiety-inducing feedback compared to face-to-face interactions (Marandi and Seyyedrezaie, 2017). These tools, including platforms like Google Drive-integrated instruction and AI applications such as Grammarly and Pigai, offer benefits particularly to introverted students who prefer anonymous feedback (Waer, 2021). Effective feedback mechanisms are essential for alleviating writing anxiety while enhancing overall writing proficiency.

With the development in ChatGPT, it has transformed human-machine interactions (Mah *et al.*, 2022). The updated ChatGPT model shows enhanced natural language understanding,

promising more accurate and adaptable responses (Rudolph *et al.*, 2023). This makes it potentially valuable in providing automated writing feedback to assist students with academic writing tasks. However, research on students' willingness to adopt ChatGPT for academic writing feedback remains limited (Chan and Hu, 2023), as does understanding the relationship between writing anxiety and their intention to use such tools (Mahapatra, 2024). To address these gaps, this study applies the Technology Acceptance Model (TAM), integrating writing anxiety as an additional variable to explore students' attitudes towards using ChatGPT for academic writing assistance.

2. Literature review

2.1 Theoretical basis

Davis (1989) proposed the technology acceptance model (TAM) (Figure 1) to assess technology usage (Tao *et al.*, 2020). TAM features perceived usefulness (PU) and perceived ease of use (PEOU) as crucial factors influencing users' intention to adopt technology (Granić and Marangunić, 2019). PU evaluates how much a technology aids performance, while PEOU measures its perceived usability (Silva *et al.*, 2022). This study adopts TAM to explore students' intention to use ChatGPT as an automated writing evaluation tool, considering its ability to incorporate attitudes and subjective norms (Gangwar *et al.*, 2015; Alqahtani *et al.*, 2022). TAM's adaptability allows for the inclusion of variables like writing anxiety, enhancing insights into technology adoption in second language writing contexts (Al-Rahmi *et al.*, 2019; Dewi and Chen, 2019).

2.2 Description of constructs and hypotheses development

2.2.1 Writing anxiety and perceived usefulness of technology. Anxiety has been reported to be negatively influential in decision-making, particularly in evaluating the utility of technology (Phillips-Wren and Adyam, 2020). Under high anxiety, people may not view technologies like ChatGPT as helpful, as proposed by George and George (2023). Such effects might arise due to impaired cognitive functions, increased distractibility, and reduced motivation, as noted by Ali *et al.* (2023). Hence, we predict that writing anxiety could negatively impact the perceived usefulness of ChatGPT as an automated writing evaluation.

H1. Writing anxiety will negatively affect the perceived usefulness of ChatGPT as an automated writing evaluation.
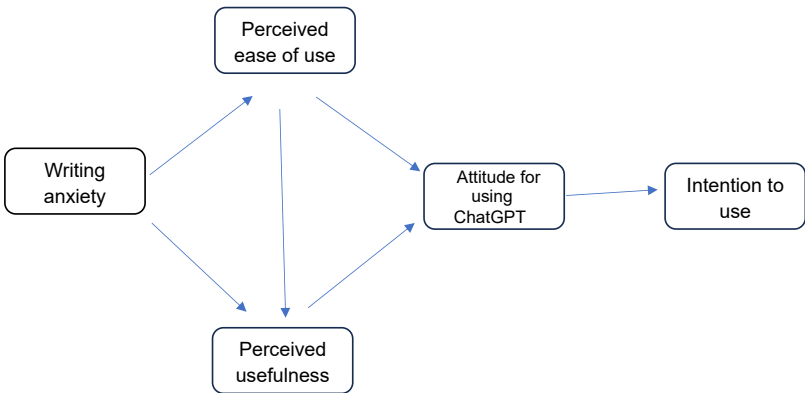

Figure 1.
Conceptual research model (informed by TAM)

Source(s): Author's own work

2.2.2 Writing anxiety and perceived ease of use. PEOU for a technology can reduce anxiety related to the use of it (Liébana-Cabanillas *et al.*, 2020). When technology is perceived as easy to use, users are less likely to experience anxiety while using it (Singh *et al.*, 2020; Brachten *et al.*, 2020). Hence, it is expected that the higher levels of writing anxiety students process will lead to a lower PEOU of the technology. Therefore, it can be hypothesized that writing anxiety will have a negative impact on the perceived ease of use.

H2. Writing anxiety will negative impact the perceived ease of use.

2.2.3 Perceived ease of use and perceived usefulness. A positive correlation exists between perceived ease of use and perceived usefulness in TAM, which has been reported in most past studies across different fields (Amin *et al.*, 2014a; Baker-Eveleth and Stone, 2020; Hussain *et al.*, 2016). These concepts are fundamental to the Technology Acceptance Model (TAM), Schnall *et al.* (2015). Davis (1989) identifies these factors as key influencers of user behavior. Building on these past literature, this study hypothesizes a positive correlation between these variables in the context of using ChatGPT as an AI assistance to academic writing.

H3. Perceived ease of use positively influences perceived usefulness.

2.2.4 Perceived ease of use and attitude for using ChatGPT. In TAM, perceived ease of use (PEOS) significantly impacts users' acceptance and utilization of technologies (Davis, 1989). It also shapes users' attitudes toward the technology, reflecting their positive or negative emotional orientations toward engaging with it (Kanchanatanee *et al.*, 2014; Thompson *et al.*, 1991). This attitude, as defined by Fishbein and Ajzen (1975), plays a crucial role in determining customers' satisfaction with the technology (Lee *et al.*, 2019). Therefore, it is reasonable to hypothesize that students' perceived ease of use positively influences their attitude toward using ChatGPT for academic writing.

H4. Perceived ease of use will positively influence the attitude towards using ChatGPT as an automated writing evaluation tool.

2.2.5 Perceived usefulness and attitude for using ChatGPT. PU is a central component in the TAM model, influencing individual perspectives on technology adoption, as highlighted in recent research conducted by Ge *et al.* (2023). Individuals are more likely to develop a favorable attitude towards a technology when they perceive it as beneficial, as noted by Kasilingam (2020). Specifically for ChatGPT, a positive inclination to use it is expected when individuals recognize its potential to aid in their academic writing (Malinka *et al.*, 2023). Informed by these findings, a positive correlation could be hypothesized between the attitudes on the utilization of ChatGPT as an automated writing evaluation tool and the perceived usefulness of it.

H5. Perceived usefulness will positively influence the attitude towards using ChatGPT as an automated writing evaluation tool.

2.2.6 Attitude for using ChatGPT and intention to use it. The theory of reasoned action (TRA) suggests that attitudes toward a technology, like ChatGPT in this study, strongly influence its adoption (Guidetti, 2019). For academic writing, these attitudes are shaped by perceived usefulness (PU) and perceived ease of use (PEOU) of ChatGPT as an automated writing tool (Bays *et al.*, 2023). Positive attitudes toward ChatGPT's effectiveness in academic writing correlate with intentions to adopt and use it further (Dwivedi *et al.*, 2023; Tlili *et al.*, 2023), indicating a direct link between attitude and intention to use ChatGPT.

H6. A positive attitude towards using ChatGPT will positively impact the intention to employ ChatGPT as an automated writing evaluation tool among Chinese students.

3. Research method

3.1 Participants

This study gathered data from 639 undergraduate students (187 males and 452 females) at a university in southern China using convenience sampling due to its practicality for data collection within the researcher's institution. All participants are majoring in teaching English to second language learners and have extensive experience with English proficiency tests and academic writing assignments. G*Power analysis determined that a minimum of 146 participants was required, based on an effect size (f^2) of 0.15, alpha level (α) of 0.05, power of 0.95, and five predictor variables. Exceeding this requirement by collecting 639 samples, the study ensured a robust dataset for analysis.

3.2 Measures

In May 2024, an online survey was conducted among 3500 (totally students majored in English language in this school) students from an English language school to gauge their acceptance of ChatGPT as an automated writing evaluation tool. The survey comprised three sections: demographic profiles, TAM constructs adapted from Davis (1989) specific to ChatGPT usage, and second language writing anxiety adapted from Cheng (2004). Participants used a 5-point Likert scale to rate their agreement with statements. Prior to distribution, the survey underwent piloting with 250 participants, whose data were excluded from the final study. The pilot study revealed strong internal consistency with Cronbach's alpha values of 0.806 for perceived usefulness, 0.975 for perceived ease of use, 0.846 for attitude towards using ChatGPT, 0.810 for intention to use ChatGPT, and 0.813 for writing anxiety, affirming the reliability of the survey instrument.

3.3 Items for assessing perceived ease of use for ChatGPT in academic writing

A four-item scale originally developed by Davis (1989) was adapted for the measurement of PEOU for ChatGPT as an automated writing evaluation tool, which includes statements such as "Using ChatGPT as an automated writing evaluation tool, academic writing becomes easy." and has shown high reliability with a Cronbach's alpha of 0.905. The reliability results demonstrate strong construct validity based on the Confirmatory Factor Analysis (CFA) results, as indicated by Hu and Bentler (1998), which have factor loadings ranging from 0.824 to 0.905.

3.4 Items for assessing perceived usefulness of ChatGPT

A five-item scale originally created by Davis (1989) for assessing the PU of using ChatGPT was modified in this study. The items included statements such as "Using ChatGPT as an automated writing evaluation enables me to write effectively." It has shown strong reliability with a Cronbach's alpha of 0.946 (Hu and Bentler, 1998) in the Confirmatory Factor Analysis (CFA), with factor loadings ranging from 0.994 to 0.995.

3.5 Items for assessing attitude towards using ChatGPT

A five-item scale, originally developed by Edmunds *et al.* (2012), was adapted to measure attitudes towards using ChatGPT as an automated writing evaluation. The items included statements such as "Using ChatGPT as an automated writing evaluation tool is better than using any other e-learning applications." and it has shown a high reliability with a Cronbach's alpha of 0.929 (Hu and Bentler, 1998), with factor loadings between 0.903 and 0.912.

3.6 Items for assessing behavioral intention to use ChatGPT

Behavioral intention to use ChatGPT as an automated writing evaluation tool was measured with a five-item scale, which was adapted from Davis (1989). The items included statements

such as "I intend to use ChatGPT as an automated writing evaluation tool for academic writing." and demonstrated a high reliability with a Cronbach's alpha of 0.989. Base on Hu and Bentler (1998), the Confirmatory Factor Analysis (CFA) results indicated strong construct validity, which have factor loadings ranging from 0.994 to 0.995.

3.7 Items for assessing second language writing anxiety
This study utilized Cheng's Second Language Writing Anxiety Inventory (SLWAI) (2004) to measure students' writing anxiety. It comprises 22 items rated on a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). The SLWAI is recognized for its reliability, with Cheng (2004) reporting a Cronbach's alpha of 0.910.

4. Data analysis
SmartPLS 4, employing partial least squares structural equation modeling (PLS-SEM) (Ringle and Sarstedt, 2016), was chosen for data analysis due to its suitability in examining relationships between latent variables, especially with smaller sample sizes and without assumptions about data distribution (Hair *et al.*, 2021). The analysis comprised two stages: first, assessing the reflective measurement model, ensuring indicator reliability (loadings $\geq$0.70), composite reliability (CR $\geq$ 0.70), and average variance extracted (AVE $\geq$0.50), along with verifying discriminant validity using the heterotrait-monotrait ratio of correlations (HTMT <0.90) (Hair *et al.*, 2021; Henseler *et al.*, 2015). Second, the structural model was evaluated through bootstrap resampling (10,000 subsamples) to estimate t-values for path significance, focusing on path coefficients (β), explained variance (R^2), and effect size (f^2) (Thien and Chan, 2022). Mediating effects were assessed using Preacher and Hayes' guidelines (2008), and model fit and predictive power were examined for robustness and applicability (Kline and Tamer, 2016; Shmueli *et al.*, 2019).

5. Results
To mitigate common method bias in this study, a full collinearity test was conducted, and all inner VIF values for variables such as attitude to use ChatGPT, intention to use ChatGPT, perceived usefulness, perceived ease of use, and writing anxiety were found to be below the threshold of 5.0 (Hair *et al.*, 2013; Kock and Lynn, 2012). This suggests the data is free from common method bias. Data cleaning procedures confirmed the absence of outliers (Tabachnick *et al.*, 2013). While multivariate normality concerns are less critical in PLS-SEM, WebPower analysis revealed significant deviations from normality in skewness and kurtosis ($p < 0.01$) (Cain *et al.*, 2017). Therefore, path coefficients, standard errors, t-values, and p-values for the structural model were estimated using a 10,000-sample bootstrap procedure to ensure robustness (Becker *et al.*, 2023).

5.1 Assessment of the measurement model
Table 1 confirms satisfactory indicator reliability with all item loadings above 0.70 and average variance extracted (AVE) values exceeding 0.50 for the five variables. Composite reliability (CR) scores are all above 0.70, establishing convergent validity. Table 2 indicates that heterotrait-monotrait ratio (HTMT) values are below the threshold of 0.90 for all variables except INT to ATU, but the confidence interval excludes 1, ensuring discriminant validity among constructs.

5.2 Assessment of structural model
Table 3 summarizes significant findings from hypothesis testing: positive relationships were observed between attitude towards using ChatGPT and intention to use it for academic

	ATU	INT	PEOS	PU	WA	Alpha	CR	AVE	VIF
Attitude to use ChatGPT (ATU)						0.942	0.956	0.811	
A1	0.903								3.504
A2	0.898								3.421
A3	0.889								3.143
A4	0.908								3.635
A5	0.905								3.642
Intention to use ChatGPT (INT)						0.849	0.930	0.869	
INT1		0.930							2.192
INT2		0.934							2.192
Perceived ease of use (PEOS)						0.908	0.936	0.785	
PEOS1			0.897						3.144
PEOS2			0.905						3.461
PEOS3			0.907						3.281
PEOS4			0.833						2.272
Perceived usefulness (PU)						0.918	0.948	0.859	
PU1				0.910					2.831
PU2				0.938					3.761
PU3				0.932					3.593
Writing anxiety (WA)						0.871	0.904	0.655	
WA1					0.783				2.296
WA2					0.868				2.811
WA3					0.809				2.538
WA4					0.786				2.063
WA5					0.797				1.806

Table 1. Assessment of the measurement model

Source(s): Author's own work

	ATU (CI)	INT (CI)	PEOS (CI)	PU (CI)	WA
ATU					
INT	0.969 (0.947.0.990)				
PEOS	0.828 (0.788.0.864)	0.801 (0.750.0.847)			
PU	0.726 (0.674.0.775)	0.639 (0.576.0.699)	0.845 (0.807.0.879)		
WA	0.200 (0.107.0.294)	0.239 (0.144.0.332)	0.106 (0.053.0.202)	0.080 (0.041.0.179)	

Table 2. Results of discriminant validity (HTMT0.90)

Source(s): Author's own work

Hypothesis	Beta	SD	t-values	p-values	Confidence Interval (CI) 5.00%	95.00%	Decision
H1: WA → PU	−0.002	0.027	0.078	0.469	−0.047	0.042	Not supported
H2: WA → PEOS	0.104	0.052	1.998	0.023	0.019	0.189	Supported
H3: PEOS → PU	0.776	0.022	34.979	<0.001	0.737	0.81	Supported
H4: PEOS → ATU	0.608	0.044	13.723	<0.001	0.532	0.679	Supported
H5: PU → ATU	0.203	0.048	4.249	<0.001	0.124	0.282	Supported
H6: ATU → INT	0.867	0.013	67.311	<0.001	0.844	0.886	Supported

Table 3. Results of the hypotheses

Source(s): Author's own work

writing ([H6](#)) ($\beta = 0.867$, $p < 0.001$), perceived ease of use and attitude towards ChatGPT ([H4](#)) ($\beta = 0.608$, $p < 0.001$), perceived usefulness and attitude towards ChatGPT ([H5](#)) ($\beta = 0.203$, $p < 0.001$), perceived ease of use and perceived usefulness ([H3](#)) ($\beta = 0.776$, $p < 0.001$), and writing anxiety and perceived ease of use ([H2](#)) ($\beta = 0.104$, $p = 0.023$). However, there was no significant relationship found between writing anxiety and perceived usefulness ([H1](#)) ($\beta = -0.002$, $p = 0.469$). Supported hypotheses ([H2](#), [H3](#), [H4](#), [H5](#), [H6](#)) highlight significant associations among these variables. [Figure 2](#) illustrates that perceived usefulness and perceived ease of use jointly explain 60.3% of the variance in attitude towards using ChatGPT for academic writing, and together with intention to use ChatGPT, they account for 86.7% of the variance in intention to use ChatGPT for academic writing.

[Table 4](#) from PLSpredict analysis shows positive Q^2 values across all indicators, indicating predictive relevance despite being relatively low (ATU: 0.018, ITU: 0.020, PEOS: 0.003, PU: 0) ([Shmueli *et al.*, 2019](#)). Comparisons of root mean square error (RMSE) between PLS-SEM and linear models reveal slightly higher prediction errors in PLS-SEM for ATU (-0.004) and ITU (-0.001), while PEOS and PU show identical RMSE values, suggesting comparable predictive performance. Overall, the model demonstrates moderate predictive strength with potential for enhancement in predictive power.

6. Discussion

This study explores how writing anxiety influences students' acceptance of ChatGPT for academic writing, using the TAM framework. It finds that writing anxiety significantly
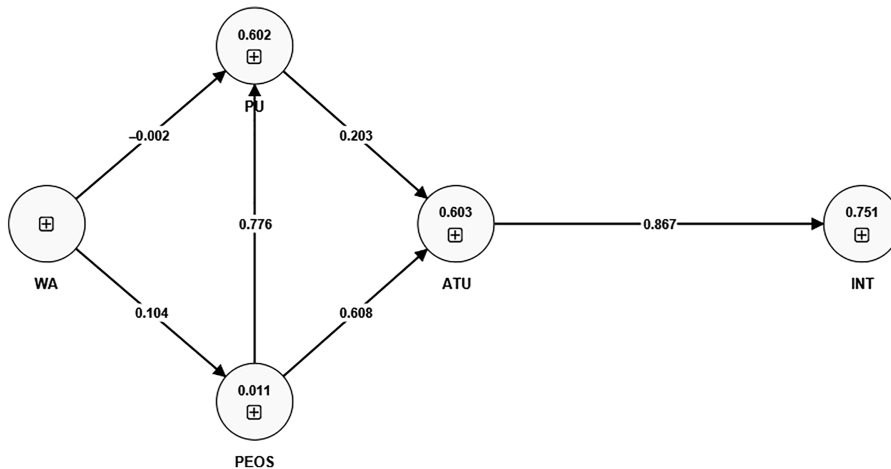
Figure 2.
The structural model

Source(s): Author's own work

Indicators	Q^2predict	PLS-SEM_RMSE	LM_RMSE	Different
ATU	0.018	0.992	0.988	−0.004
INT	0.020	0.992	0.983	−0.001
PEOS	0.003	1	1	0
PU	0	1.001	1.001	0

Source(s): Author's own work

Table 4.
Model's predictive power by PLSpredict

affects perceived ease of use (PEU) and attitude toward ChatGPT, both positively linked to intention to use. Surprisingly, writing anxiety does not directly impact perceived usefulness (PU). The study supports a positive relationship (H2) where higher writing anxiety increases perceived ease of use of ChatGPT, suggesting anxious students may find the tool more appealing. This aligns with findings emphasizing user-friendly interfaces in reducing anxiety and promoting technology adoption (Liébana-Cabanillas *et al.*, 2020). Moreover, perceived ease of use (H3) positively influences perceived usefulness, reflecting TAM principles (Davis, 1989). Perceived usefulness (H5) in turn positively affects attitude toward using ChatGPT, crucial for fostering favorable attitudes among students by demonstrating practical benefits. Notably, a strong positive association (H6) is observed between attitude and intention to use ChatGPT, highlighting attitude's pivotal role in adoption decisions, in line with the Theory of Reasoned Action and TAM (Ajzen and Fishbein, 1980). These findings are essential for educators integrating AI technologies such as ChatGPT effectively into educational environments.

7. Theoretical and practical implications

The study provides practical insights for educational stakeholders on integrating AI tools in academic settings. It emphasizes the need for training to optimize tool use and highlights how user-friendly AI interfaces can alleviate writing anxiety among students, fostering greater acceptance of these technologies.

Theoretical implications underscore the role of second language writing anxiety in influencing students' perceptions of AI tools within the Technology Acceptance Model (TAM). The findings affirm TAM's principles by showing that user-friendly AI interfaces enhance perceived usefulness and positively shape attitudes, aligning with the Theory of Reasoned Action's emphasis on attitude in technology adoption. This study enhances understanding of psychological factors in technology adoption in educational contexts.

8. Conclusion

In conclusion, this study highlights the influence of second language writing anxiety on students' adoption of AI tools like ChatGPT for academic writing. The findings indicate a positive attitude towards ChatGPT, contributed by user-friendly interface and efficiency, have the potential to significantly enhance the academic writing process, since it will reduce student's writing anxiety. By integrating psychological factors such as writing anxiety into the Technology Acceptance Model, this study provides a more comprehensive framework for understanding technology adoption in educational contexts. The findings underscore the need for policies that support the integration, training, and ethical use of AI tools in education, ultimately aiming to improve students' writing skills and academic performance.

9. Recommendations for future research

Future research can build on the findings of this study by exploring several key areas. First, longitudinal studies could offer deeper insights into how sustained use of these tools influences writing development over time. In addition, diverse student populations with varying demographics (e.g. age, educational background, cultural context) may affect the adoption of AI tools in academic writing. Therefore, further studies might explore more on that, which can help tailor AI tools to meet the needs of diverse student populations. By addressing these areas, future research can provide deeper insights into the role of AI tools in education and inform the development of more effective and user-friendly technologies for academic writing.

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